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ANALYSIS OF THE MANAGEMENT SITUATION
ROSEBURG DISTRICT
BUREAU OF LAND MANAGEMENT

TIMBER RESOURCES

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TIMBER RESOURCES

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I. INTRODUCTION

The Timber Resources section of the Roseburg District Analysis of the Management Situation (AMS) covers the Douglas and South Umpqua Master Units. Three planning units - North Umpqua, Drain and Dillard - make up the Douglas Master Unit. The South Umpqua planning unit covers the entire South Umpqua Master Unit.

For Resource Management Plan (RMP) purposes, the plant communities (plant associations) of the planning units have been grouped into "Major Plant Groupings" as described in the Vegetation section of this AMS.

A description of the commercial timber species, the non-commercial tree species, and many of the major shrub species native to the District can be found in "Trees to Know in Oregon" (Extension Bulletin 697, Oregon State University and the State Department of Forestry, 1975).

Ninety-five percent of the Roseburg District's 401,900 acres of commercial forest land base (1977 TPCC) is ecologically capable of supporting commercial forests which yield over 20 cubic feet per acre per year.

Climatic conditions of the District, characterized by cool winters, warm to hot summers, and moderate annual precipitation with a summer rainfall deficiency, have resulted in predominantly coniferous forests.

Nature and man have altered the composition of the forest. Fires, both natural and man-caused, have created a patchwork of even-aged stands where the existing stands were destroyed by high intensity fires. Mixed-aged stands containing varying numbers of old growth (trees greater than 200 years old) occur where the fires were less severe. Douglas-fir comprises 80% of existing stand volume and owes its prominance to fire.

Non-native tree diseases have been introduced into southwestern Oregon. Of these, the white pine blister rust, which also infects sugar pine, is the most serious economically and ecologically. BLM joined in projects to eradicate the alternate host, ribes sp., during the 1940's and work began selecting resistant trees in the late 1960's. Resistant trees are currently being bred for seed and ultimate outplanting into harvested units.

Winter storms with high winds have also changed the forest. Normal winter storms have created occasional windthrow, while major storms such as the 1962 Columbus Day windstorm, created extensive concentrations of blowdown that were harvested by salvage sales followed by prompt reforestation.

Settlement also resulted in the introduction of at least 16 species of non-native grasses. In drought years competition for moisture between these grasses and Douglas-fir becomes intense, and in the absence of effective controls, the grasses often cause poor seedling survival.

Man's influence on the appearance and composition of the forest with timber harvesting operations began in the late 1800's near Roseburg and other interior valley communities. Early log transport was by water. Industry later constructed railroads or major haul roads to their logging camps and timber holdings.

Where Government lands were encountered, companies could apply for a timber patent through the General Land Office (GLO) located in Roseburg. These patents issued for ten-year periods, were sold by legal subdivision often exceeding a section in size. The patent did not contain any requirements for road location, harvest methods or reforestation.

The O&C Sustained Yield Act of 1937 ended the timber patent system and initiated the concept of sustained yield forest management. Harvest activities in the area continued to be concentrated on industry lands until the 1950's. The sale of BLM timber has been continuous since then, partially resulting in the present age class distributions.

Since 1937, harvesting techniques and management practices have changed considerably. Under the timber patent-process, cutting was mostly an "economic selection" or high grading operation - basically taking the best and leaving the rest. As yarding equipment was mainly large stationary steam donkeys, roads were located at or near water grades. Reforestation was by natural seeding from residual trees or adjacent leave blocks.

During the 1950's and early 1960's large clearcut units (often exceeding 100 acres in size) were laid out by BLM employees and roads were built into the more inaccessible locations. Yarding was accomplished by wooden spar trees and gas or diesel powered yarders. Site preparation through burning of the logging debris was required with the purchaser liable for damages if fires escaped. Consequently burning was done in the fall after the rains began. Reforestation was also required of the purchaser. Planting or aerial seeding was the common practice. There was no consideration for the seed source however and, as a result, many areas were planted/seeded from off-site seed sources resulting in production not being at the site's capacity.

In the 1970's and 1980's concern about the environment and other resources resulted in smaller units, road locations designed to the topography, and yarding requirements which minimized damage to watersheds (one end or full log suspension or aerial systems). Responsibility for site preparation by burning was transferred to the BLM resulting in shifting the time for burning to the spring when soils were not as susceptible to damage. Emphasis was also placed on improving reforestation success and timber production. Seedling production was improved, using seed of known origin. Large planting stock was utilized in areas where vegetation competition was severe. Tree planting replaced aerial seeding as a standard practice. Since 1957, planting has been done by contract, with the BLM taking increased precautions to minimize stress to seedlings during storage and handling, and carefully monitoring actual planting. Animal damage to planted seedlings from rodents, deer, and elk was minimized by installing protective plastic mesh (vexar) tubing. Seedlings on droughty sites were protected by paper mulches and/or shades.

Competing vegetation was controlled through the use of prescribed fire, herbicides or manual methods. Herbicide use was stopped in 1984 by a court order arising from interpretation of the requirements for environmental analysis. The BLM and the Forest Service prepared new vegetation management environmental impact statements (EIS) which are now at the record of decision stage. Since 1984, less effective and more expensive manual treatments have been used to attempt to control unwanted vegetation. Precommercial thinning of dense young coniferous stands to maximize growth of future crop trees was an accepted practice. Commercial thinning to capture existing and anticipated mortality increased timber production. Fertilization of natural and reforested stands was done to speed growth.

From 1984 to 1988 timber sale offerings varied due to budget levels, the allowable cut effects due to intensive forestry practices, and political effects such as the buy-back and fire salvage credit programs. The sales program has also been constrained by the loss of herbicides amounting to 9 million board feet (MBF) annually. The Allowable Sale Quantity (ASQ) in the existing plan is 247 MBF with the use of intensive forestry practices. The District has averaged 231 MBF during this period.

II. EXISTING CONDITIONS

Table T-l shows the acreage of forest land by ownership and county within the planning area.

Table T-1. Forest Area and Growing Stock, by Owner for the Roseburg Timbershed (1989)1/

Roseburg Timbershed (Douglas Co.)	Forest Land Available (thousand acres)	Forest Land Not Available (thousand acres)	Total Forest Land (thousand acres)	Available Growing Stock 2/ (million cubic feet)
Public				
National Forest	611	285	896	2,602
Bureau of Land Management3/	522	77	599	2,206
State and Other	39	9	48	219
Private				
Forest Industry	750	9	750	1,586
Non-industrial	287	0	287	663
Total:	2,209	371	2,580	7,276

1/Johnson, K. Norman; John Bueter, et al. 1990. Timber for Oregon's Tomorrow - the 1989 Update. The Roseburg Timbershed is comprised of Douglas County.

2/National Forest growing-stock data are based on 9-inch dbh to a 6-inch top for natural stands and 7-inch dbh to a 4-inch top for managed stands. BLM and state data are based on 7-inch dbh to a 4-inch top for all stands. Private data are based on 5-inch dbh to a 4-inch top for all stands.

3/Includes acres administered by Roseburg, Eugene, Coos Bay and Medford Districts.

Of the 522,000 available BLM acres shown in Table T-1, the Roseburg District administers approximately 367,500 acres (70%). Virtually all of the lands the District administers lie in Douglas County (exception: 320 acres - Jackson County; 280 acres - Lane County). Roseburg District Administration covers 24% of available Douglas County lands and 46% of all available Federal lands in the county. About 30% of the available growing stock in Douglas County is BLM.

Table T-2 displays the ownership, forest area and growing stock available in 1975, on forest lands in Douglas County. During the elapsed time of 14 years, total forested acreage has decreased somewhat, probably due to conversion to other than forest uses - roads, recreation facilities, powerlines, etc. Total volume of growing stock on Federal lands has decreased 37% due primarily to harvest but also due to set aside and special management designations on Federal forests in plans approved in the late '70's and early '80's. The level of growing stock on BLM lands has decreased 8% in the same period.

Table T-2 **Volume of Growing Stock on Commercial Forest Land by County**

County Name	BLM[1/]	USFS[1/]	Other[2/3/] Public	Forest[2/3/] Industry	Other[2/3/] Private	Total
			Million Cubic Feet[4/]			
Growing stock						
Douglas	2,859	5,537	249	1,821	673	11,139
Jackson	988	1,833	22	691	313	3,847
Lane	1,150	7,569	162	1,550	679	11,110
TOTAL	4,997	14,939	433	4,062	1,665	26,096
			Million Board Feet[5/6/]			
Saw timber						
Douglas	16,514	32,689	1,084	6,772	1,951	59,010
Jackson	4,925	9,622	66	2,007	748	17,368
Lane	6,494	45,236	753	5,438	2,274	60,195
TOTAL	27,933	87,547	1,903	14,217	4,973	136,573

[1/] Gedney, 1982
[2/] Gedney, Bassett, Mei 1986A
[3/] Gedney, Bassett, Mei 1987
[4/] Includes live trees of commercial species 5.0 inches DBH and larger to a variable top
[5/] Includes softwood trees 9.0 inches DBH and larger and hardwood trees 11.0 inches DBH and larger. Volume estimated in terms of Scribner 32 foot Log Rule for conifers and 16 foot logs for hardwood.
[6/] Conversion factor varies from 5 to 8 B.F./C.F. based upon tree size. Reference: Past timber sale short log volumes.

The O&C Act requires determination of the productive capacity of O&C and Coos Bay Wagon Road (CBWR) lands and the sale of timber on a sustained yield basis. Experienced BLM Foresters have installed hundreds of permanent forest inventory plots in accordance with the nationwide forest inventory system. These plots have been remeasured and supplemented to determine the current standing timber volume. Qualified cruisers estimated the volume of the plots, and approximately 20% of the plots were check cruised by the District check cruiser to assure that accuracy standards were met. Plots were also check cruised by the State Office check cruiser to assure accuracy standards (± 10%) were met.

Table T-3 ***Roseburg District Age Class/Site Class Distribu BLM Suitable Commercial Forest Lands1/ as of October 1, 1***

Age Class	Site Class2/ I	II	III	IV	V	Other3/	Total Acres	Total Cubic Foot Volume (MCF)
0	0	932	5,966	12,200	1,757	729	21,584	32
5	34	259	7,544	10,096	1,010	2	18,945	589
10	39	1,279	17,144	19,351	1,297	5	39,115	1,336
20	43	767	15,565	10,975	702	33	28,085	11,262
30	17	1,173	16,936	12,337	720	47	31,230	48,117
40	0	455	6,024	5,775	488	25	12,767	39,417
50	0	254	3,982	3,245	407	6	7,893	32,937
60	23	267	1,533	1,770	580	3	4,176	17,724
70	0	43	2,042	2,423	659	41	5,207	30,013
80	0	58	2,013	3,106	725	99	6,000	33,473
90	13	487	3,648	4,890	939	24	10,000	85,350
100	50	278	3,383	4,890	897	91	9,589	83,367
110-150	52	1,392	19,030	23,075	3,713	62	47,324	308,014
160-200	0	524	16,082	44,967	3,435	101	65,109	495,115
210+	3	2,614	20,201	23,916	3,232	44	50,009	408,105
Totals	273	10,781	141,092	183,015	20,559	1,313	357,034	1,594,850

1/ Forest Operations Inventory (FOI) GIS acreage estimates with deductions for non-forest, roads, suitable and non-suitable woodlands, and riparian buffer strips.
2/McArdle 100-year Site Class estimates converted to Hann-Scrivani 50-year Site Classes.
3/ Non-forest units with forestable inclusions and low site lands.

Table T-4 Comparison of Roseburg District Inventory Data 1978 and 1988

Age Class	GLO1/ Acres	GIS2/ Acres	Cubic Volume (Mcf)		Board Foot Volume (MMbf)	
	1978	1988	1978	1988	1978	1988
0	7,403	22,065	0	33	0	0
1-5	25,510	19,393	0	606	0	3
10	40,853	40,315	0	1,376	0	7
20	35,945	29,316	0	11,755	0	59
30	13,852	32,525	22,805	50,132	118	258
40	5,973	13,362	12,950	41,236	68	217
50	7,558	8,201	19,463	34,184	104	183
60	11,319	4,271	33,483	18,152	183	99
70	8,959	5,389	30,162	31,059	168	173
80	10,931	6,211	40,831	34,731	231	197
90	11,741	10,312	47,854	88,411	275	509
100	13,282	9,865	58,885	85,807	343	502
110	16,879	8,276	80,544	57,938	475	344
120	15,852	14,215	80,151	79,847	480	480
130	3,595	15,744	19,293	107,540	116	658
140	3,595	5,677	20,222	35,537	123	218
150	10,545	4,969	62,067	37,537	377	234
160	5,615	2,760	34,170	21,103	215	131
170	6,197	5,788	38,565	44,472	237	281
180	21,947	3,532	144,301	23,804	937	151
190	8,305	5,101	52,991	27,430	327	168
200+	105,214	103,763	810,335	836,071	5,285	5,396
TOTAL	391,070	371,048	1,609,072	1,668,744	10,062	10,267

1/ URA 4 Land Base, GLO acreage estimates with deductions for congressional designations, TPCC withdrawals, and a reduction for roads.

2/ Forest Operations Inventory (FOI) GIS acreage estimates with deductions for non-forest, roads, suitable woodlands and non-suitable woodlands.

As shown in table T-4, there is approximately the same volume in the 1988 inventory as in the 1978 inventory. The differences were analyzed by District and State Office personnel. Reasons for the difference include:

-- Inclusion of volume less than 40 years old in the 1988 data but not in the 1978 data;
-- Inclusion of hardwood volume in 1988 data but not in 1978 data; and,
-- Differences in data analysis techniques between 1988 and 1978.

Table T-5 displays District acres classified by stocking density and status of establishment.

Table T-5 **Stocking Classifications for Units with Birth dates Between January 1, 1971 and October 10, 1988 1/**

Stocking Classification	Forestable Acres	Total Acres
Understocked		4,326
Unestablished	4,150	
Established	176	
Stocked		62,525
Unestablished Minimum	2,429	
Unestablished Target	34,773	
Established Minimum	1,129	
Established Target	24,194	
Nonstocked		18,425
Sold but not Cut	7,468	
Cut, needs Site Prep	6,604	
Site Prepped, needs Planting	4,132	
Other	221	
Totals	85,276	85,276

1/Based on most recent survey data as of October 1, 1988
Source: Micro*Storms.

**Of the 85,276 acres considered here, 18,425 acres (22%) are classified non-stocked. The time units are placed in non-stocked status averages less than three years. During this time, units are sold, roads built, logging takes place, and site preparation is accomplished prior to planting.

Of the newly planted areas, 62,525 acres (94%) have sufficient trees on site to meet current stocking standards. About 6% of the sites are understocked due to a variety of factors most important of which is excessive competing vegetation.

Table T-6 tabulates District acres treated by practice or combination of practices according to age class.

Table T-6 **Acres of Stand Treatment Accomplishments by Age Class As of October 1, 1988**

Age Class	Genetically Improved Stock	PCT	PCT & Fert.	Fert. & CT	PCT & CT	CT Only	Total Treatment Acres
5	434	0	0	0	0	0	434
10	156	609	564	0	0	0	1,329
20	0	6,610	5,507	0	0	0	12,117
30	0	7,272	9,750	0	0	165	17,187
40	0	543	2,246	12	32	20	2,853
50	0	283	937	0	0	90	1,310
60	0	0	17	0	0	248	265
70	0	0	0	0	0	116	116
80+	0	0	0	0	0	643	643
Total	590	15,317	19,021	12	32	1,282	36,254

PCT = Precommercial thinning
Fert = Fertilization
CT = Commercial thinning

These intensive management practices increase yield. Precommercial thinnings have been the mainstay of accomplishment due to the greater returns per investment dollar.

Until 1987, Douglas County led the nation in timber harvested. Lane County now leads by a small margin. These harvests can be attributed to county size and forested area, with stands of high volume per acre. The Roseburg District is almost 100% within Douglas County.

Table T-7. **Volume Harvested by County and Ownership Thousand Board Feet (Scribner L Scale).**[1]

Calendar Year	County	Forest Industry[2]	Other Private[2]	State	BLM[3]	National Forest[4]	Other Public[2]	Total
1977	Douglas	648,805		22,530	299,476	298,334	0	1,269,145
	Lane	329,623		13,636	163,699	602,334	0	1,109,228
	Jackson	116,365		41	83,374	139,392	0	339,172
1978	Douglas	665,617	48,169	27,044	92,070	412,748	25	1,245,673
	Lane	324,304	33,406	7,464	204,587	588,891	0	1,158,652
	Jackson	136,463	13,465	778	96,450	163,891	0	411,057
1979	Douglas	676,384	20,993	17,341	277,803	376,435	415	1,369,371
	Lane	369,380	29,672	1,965	139,571	705,070	0	1,245,667
	Jackson	95,194	7,692	168	114,749	158,311	0	376,114
1980	Douglas	729,556	23,501	13,944	186,545	181,722	488	1,135,751
	Lane	309,605	15,623	17,031	144,031	493,188	0	979,478
	Jackson	87,996	8,525	5	87,417	133,632	0	317,575
1981	Douglas	598,577	19,478	6,779	199,894	170,716	0	995,444
	Lane	315,894	13,256	2,901	118,448	328,373	130	779,002
	Jackson	52,821	7,271	762	65,872	137,236	0	263,962
1982	Douglas	694,122	39,970	18,203	68,431	137,826	85	958,63
	Lane	488,718	21,449	6,632	82,282	347,781	14	946,876
	Jackson	104,368	2,415	0	17,877	62,011	78	186,749
1983	Douglas	677,539	36,411	2,297	217,103	318,592	0	1,251,942
	Lane	444,651	38,141	11,621	120,113	477,354	160	1,092,040
	Jackson	118,726	6,117	11	96,652	173,613	208	395,357
1984	Douglas	646,848	32,880	11,015	261,391	324,498	1,833	1,278,465
	Lane	414,599	33,320	6,550	139,646	594,070	12	1,188,197
	Jackson	112,509	9,286	0	100,945	118,683	0	341,423
1985	Douglas	636,113	35,692	23,779	290,188	327,008	286	1,313,066
	Lane	433,606	46,404	12,762	165,750	626,040	20	1,284,582
	Jackson	189,978	4,441	1,698	81,263	182,683	26	460,089
1986	Douglas	591,435	38,227	31,608	349,410	492,455	50	1,503,185
	Lane	454,691	34,477	6,407	194,221	646,725	537	1,337,058
	Jackson	186,084	3,350	1,077	73,418	142,398	0	406,327
1987	Douglas	471,437	30,854	21,645	378,054	406,283	3,274	1,311,547
	Lane	464,156	46,394	288	183,463	633,954	0	1,328,255
	Jackson	118,893	6,730	3,338	103,921	131,689	0	364,571

1/ Includes volume removed (softwood and hardwood) as logs, poles and pilings but not vol removed from woodcutting operations.
2/ Compiled by Oregon State Department of Revenue.
3/ Compiled by Bureau of Land Management.
4/ Compiled by United States Forest Service, Region 6.
SOURCE: Oregon Timber Harvest Reports, Oregon State Department of Forestry

The portion of the Douglas County harvest attributable to Roseburg District BLM in Table 7 is reported on a calendar year basis while the District harvest shown on Table 8 is tracked on a fiscal year basis. The pattern of reduced harvest during and immediately following recessions is evident. Note also the escalating harvest since 1982. This phenomenon is caused by several actions of the Federal government: 1) grace period extensions and the Federal Timber Purchasers Contract Modification Act which extended high priced contracts purchased during the period 1979 through December 1982, up to five years, and 2) the wildfires of 1987 and 1988 which prompted offering extensions on green timber already sold in order that purchasers might shift their logging to burnt timber that was highly susceptible to deterioration.

Table T-8. Roseburg District Volume and Value of Timber Sold and Harvested in Douglas County.[1/]

Fiscal[2/] Year	Volume Sold MBF	Value Sold	Volume Harvested MBF	Value Harvested
79	188,096	45,533,144	169,750	27,200,000
80	190,483	56,882,231	147,500	26,150,000
81	182,891	47,517,872	153,000	25,100,000
82	194,243	18,334,397	51,100	12,340,000
83	199,621	21,189,442	98,100	13,900,000
84	211,700	19,889,305	167,261	19,971,579
85	173,225	11,936,581	198,010	19,382,337
86	304,522	23,249,487	249,426	24,488,854
87	251,591	23,397,541	255,893	23,401,692
88	215,437	23,266,147	371,708	36,357,327

1/ The Roseburg District administers 280 acres in Lane and 320 acres in Jackson Counties. Harvesting on these lands occurs on a sporadic basis; because of this, the minimal values developed are not significant for purposes of this table.

2/ October 1 of one year to September 30 of the following year.

Timber volume in a log, tree, or timber stand can vary greatly depending on measurement rule selected to estimate the volume. This is evident in Table T-9 which compares volume estimated using cubic foot, Scribner short log and the Scribner long log volume tables.

Source: Information from FY 1977 through FY 1983 is from "BLM Facts" and Roseburg District records. FY 1984 through FY 1988 information is from the "Timber Sale Information System"

Table T-9. Comparison of Cubic Volume Scribner Short Log and Scribner Long Log Volume Tables.1/

Volume Estimator					
Diameter					
Breast Height	Merchantable Top	Length to Merchantable Top	Cubic Feet	Board Feet Long Log (32') Scribner Scale	Board Feet Short Log (16') Scribner Scale
12"	5"	80'	30	130	170
24"	7"	128'	170	910	1080
36"	9"	160'	410	2530	2840
56"	13"	192'	1100	7190	8070

1/ Comparisons of Scaling Bureau Long Log truck scale with BLM Short Log Scale or 32' Scribner or Cubic Scale are not meaningful. The Scaling Bureau Long Log scale varies greatly depending on length of logs actually cut, the rate of taper and the percent recovery.

Table T-9 illustrates the differences in measurement results. The BLM conducts inventories, operational cruising, and scaling on a cubic foot basis and converts the result to Scribner Short Log Scale (16'). Cubic foot measure accounts for all the fiber in a log whether the end product is board feet of 2 x 4's, plywood square feet of plywood of variable thicknesses, cords of chips, units of chips, squares, flitches, lugs, plugs, blanks, staves, hog fuel, etc. The basic difference between the cubic foot rule and board foot rules is that the cubic foot rule accounts for all the fiber in a tapered log whereas board foot rules map the number of boards of given sizes that can be sawn from a cylinder whose diameter is determined by the diameter of the small end of a tapered log. All of the fiber outside of this cylinder and saw kerf is unaccounted for in the board measure. This fiber is generally recovered for its value as short boards, chips, veneer, etc., in highly competitive markets.

Congressional actions have resulted in the designation of an area where BLM does not have the ability to manage the lands under its jurisdiction for timber production. This area is shown in Table T-10.

Table T10: Acres of BLM Land Included in Congressionally Designated Areas

		Classification				Total	
Name	Type of Designation	SCFL	SWL	NSWL	NF	Land Acres	Status
North Umpqua River	Wild & Scenic River	992	0	64	235	1291	O&C

SCFL	Suitable Commercial Forest Land
SWL	Suitable Woodland
NSWL	Non-suitable Woodland
NF	Non-forest Land

III CURRENT MANAGEMENT DIRECTION

Current management direction for the District is based on the Management Framework Plan (MFP) derived from the Roseburg Timber Management EIS and Record of Decision (ROD) (USDI,BLM,Roseburg District Office (RDO), 1983).

Table T-11 displays current commercial forest land base from the 1983 ROD, while Table T-12 displays the new suitable forest land base for 1990.

Table T-11. **1983 Land Use Allocations**

Planned Timber Harvest	Acres[1]
Intensive Base	331,637
Constrained Base	
VRM	2,658
Wildlife	33,210
Subtotal	367,505
No Planned Timber Harvest	
Non-forest Lands	19,660
Non-commercial Forest Lands	2,259
MFP Withdrawals [2]	23,565
Fragile Site Withdrawals	2,614
Reforestation Withdrawals	8,293
Subtotal:	56,391
Total Sustained Yield Unit (SYU) Acres	423,896

[1] Acreage estimates are based on General Land Office (GLO) Master Title Plats circa 1983.

[2] These are commercial forest lands withdrawn from the timber production base for other resource considerations.

Table T-12. 1990 Alternative "A" Land Use Allocations

Planned Timber Harvest	Acres[1]
Intensive Base	351,955
Suitable Woodland	2,939
Subtotal	354,894
No Planned Timber Harvest	
Non-forest Lands	
Non-forest	7,681
Roads	15,365
Riparian	14,101
RMP Withdrawals [2]	5,013
NON-Suitable Woodlands	22,020
Subtotal	65,368
Total Sustained Yield Unit (SYU) Acres	419,074

[1] Acreage statistics derived from GIS estimates utilizing FOI and TPCC allocations.

[2] RMP Alternative "A" withdrawals include: T&E species habitat protection for the Bald Eagle, the North Umpqua Wild and Scenic River designations, and existing recreation sites.

The Total Sustained Yield Unit acreage listed in Table 11 differs by 4,822 acres from the Table 12 total. This 1% drop is the result of the decision to adopt more accurate mapping procedures derived from orthophotographs and use of GIS.

The total annual sustained yield harvest level (allowable sale quantity) determined in the EIS and ROD, and set forth in the MFP is 246.7MMBF (intensive timber base, 240.4 MMBF; constrained base, 6.3 MMBF). This is rounded to 247 MMBF for planning and accounting ease. Conifer timber available for final harvest is an average minimum size of 14 inches diameter at breast height (DBH), which is normally reached in 50 years.

The area within the District is dominated by high value commercial forest land. Nearly 402,000 acres or 95% of the land base is classified as commercial forest land (CFL). Of the remaining 5%, 2,200 acres are non-commercial forest and 20,000 acres are non-forested.

In the 1983 MFP 82% (331,600 acres) of the CFL base was being managed employing intensive forest management practices. Intensive management practices applied to this area includes planting genetically improved stock, precommercial thinning, fertilizing, and commercial thinning. 9% of the CFL base (35,900 acres) is being managed under an extended rotation of 250 years, while another 9% (34,400 acres) is withdrawn from timber harvest.

In the 1983 MFP, over 110,000 acres of 200+ year-old stands remained on the Roseburg District, representing about 27% of the commercial forest lands (CFL). The District has allocated 36,000 acres on an extended rotation of approximately 250 years. Both small (80 acre) and large (600 acre) blocks of mature and 200+ year-old stands are distributed throughout the District in 500 foot elevation bands by forest seed zone.

Approximately 18,000 acres of CFL have been withdrawn from the intensive management base in no-cut buffers, averaging 100 feet on either side of third order and larger streams. Seven areas totalling about 2,600 acres have been designated for protection as having unique or special values. An additional 3,200 acres is withdrawn from timber harvest for raptor habitat, while 2,000 acres are protected for recreational, archaeological and botanical sites.

Table T-13 illustrates annual timber management and forest development treatment goals that were funded as well as the average annual accomplishment for the past five years.

Table T-13 **Management Framework Plan Goals, Funding, and Accomplishment (FY 1984 through FY 1988) October 1, 1983 through September 30, 1988**

Practice	MFP Annual Plan Goals	Annual Average Funded (5 year)	Annual Accomplished 5 Year
Allowable Sale Quantity (ASQ)1/			
Million Cubic Ft.	39.5	37	36.8
Million Board Ft.	247	231	230
Clearcut Acres	5,709	5,232	5,272
Partial Cut Acres	471	511	511
Site Preparation			
Burning	4,450	2,761	2,761
Herbicides	5,200	0	0
Manual	170	231	231
Mechanical	400	154	154
Planting (initial)			
Regular	5,230	3,896	3,869
Improved	----	112	112
Animal Damage Control	3,080	1,507	1,507
Release & Maint. (herbicides)	4,000	0	0
Release & Maint. (manual)	0	263	263
Pre-commercial Thinning	4,040	1,656	1,656
Fertilization	5,560	2,702	2,702

1/ NOTE: The base level ASQ excluding intensive management practices of Pre-commercial thinning and fertilization is 209 MMBF.

Source: District records, TSIS, and the Annual Reforestation report.

As seen above, annual ASQ accomplishments have fallen short of the annual plan goal by 7%. Factors that have contributed to this shortfall are budget limitations and by harvest level adjustments for short term loss of use of herbicides.

1977 and 1988 TPCC Inventories

BLM utilizes a land classification system to partition all public lands based on the physical and biological capability of the site to support and produce forest products on a sustained yield basis using operational management practices. This timber production capability classification (TPCC) system will be used to determine the commercial forest land base for both the MFP approved in 1983 and for the RMP scheduled for completion in 1991. Table T-14 displays the 1977 TPCC Summary while Table T-15 displays the 1988 TPCC Summary.

There are some basic differences between the two inventories that make direct comparisons difficult. A description of the two inventories follows along with an explanation of the most significant differences.

In 1977 the TPCC partitioned land within the District into major classes indicating relative suitability to produce timber on a sustained yield basis. The five major classes were high intensity management, limited management, withdrawn, non-forest, and non-commercial forest lands.

Table T-14. District TPCC Summary of 1977

Commercial Forest Land	Acres
1. High Intensity Management	
No Problem	238,980
Fragile Restricted	40,703
Fragile/Reforestation Restricted	6,272
Reforestation Restricted	85,450
Subtotal	371,405
2. Limited Management (Final Harvest Only)	
Fragile Restricted	750
Fragile/Reforestation Restricted	1,746
Reforestation Restricted	16,280
Subtotal	18,776
3. Withdrawn	
Fragile Withdrawn	1,888
Fragile/Reforestation Withdrawn	718
Reforestation Withdrawn	8,537
Adverse Location	187
Subtotal	11,330
4. Non-Forest	
Roads, R/W corridors, Rec. Sites, rock outcrops, grass, agriculture	20,135
5. Non-commercial Forest	
Sites not capable of yielding at least 20 cf of a commercial species, and non-commercial tree species	2,285
Roseburg District Total. Not corrected to GLO acres (35 acres difference)	423,931

Source: TPCC classification as of June 8, 1982, on file as District URA 4 Inputs

High Intensity Management Lands

High intensity managed lands are commercial forest lands that could be managed without undue loss of site productivity and be adequately reforested within specified time limits following regeneration cuts. These lands form the base acreage used to compute the annual sale quantity.

The classification contains two major sub-classes: Non-problem sites and restricted sites.

Non-problem sites are commercial forest lands that could be managed by clearcut or partial cut with expectations of adequate regeneration within five years of the regeneration cut using standard reforestation techniques.

Restricted sites are commercial forest lands on which management is limited for timber production. This classification contains three sub-classes: fragile- restricted, both fragile and reforestation-restricted, and reforestation-restricted.

Limited Management (Final Harvest Only)

Some regenerated stands in the District are not stocked to the minimum trees per acre specified in reforestation goals. These are identified as limited management only since costs for intensive management practices such as precommercial thinning and fertilization would exceed benefits. Also, growth gains from intensive management practices would not accrue in these understocked stands.

Withdrawn

These are commercial forest lands which, because of their severe physical and biological limitations are not capable of receiving management for wood fiber production without causing site productivity losses and/or result in understocked conditions after five years, and stocked unestablished in fifteen years.

These lands are withdrawn from timber production base and are not considered for ASQ computations. In the case of catastrophe, these sites would be re-analyzed to determine what course of action should be taken to best serve the total resource value.

Also included is an adverse location classification which is defined as: sites difficult or impossible to manage because of their physical isolation.

Non-Forest Land

Areas within the forest zone that are not capable of being at least 10% stocked with forest trees, and those lands which were converted to non-forest uses. Examples of non-forest lands are: roads, powerline rights-of-way, rock outcrops, rivers and lakes.

Non-commercial Forest Land

Lands which are not capable of yielding at least 20 cubic feet of wood per acre per year of commercial species. This classification is divided into two sub-classifications: sites not capable of yielding at least 20 cubic feet per acre per year of a commercial species; or sites on which only non-commercial tree species are capable of growing.
Non-commercial species includes all hardwoods, salable or non-salable. If the site contains non-commercial species but is capable of producing more than 20 cubic feet per acre of a commercial coniferous species it is considered to be commercial forest land.

The 1988 TPCC Inventory

Table T-15 summarizes the updated TPCC.

Table T-15 District TPCC Summary of 1988

	Acres			
	O&C	PD[1]	CBWR	Total
NON-FOREST				
Rockland	3,301	682	681	4,664
Brush	78	0	0	78
Grass	315	73	0	388
Water	996	68	1	1,065
Highway	14,884	422	566	15,872
Utility	598	11	25	634
Agriculture	0	0	0	0
Non-Forest Unclassified	321	119	0	440
Subtotal	20,493	1,375	1,273	23,141
NON-SUITABLE WOODLAND				
Fragile Non-Suitable	19,625	1,742	626	21,993
SUITABLE WOODLAND				
Low Site	37	0	0	37
Non Commercial Species	148	58	12	218
Non-Suitable CFL (Reforestation Problem)	2,695	101	0	2,796
Subtotal	2,880	159	12	3,051
SUITABLE COMMERCIAL FOREST LAND				
Non-Problem	482	14	1,964	2,460
Fragile Suitable	1,610	160	991	2,761
Cat. I - Reforestation Problem	197,441	7,588	6,329	211,358
Cat. II - Reforestation Problem	0	0	0	0
Combination Reforestation and Fragile Problem	144,702	7,132	2,794	154,628
Subtotal	344,235	14,894	12,078	371,207
Totals	387,233	18,170	13,989	419,392

[1] Acquired Lands are included with the PD totals.
Source: Acreage estimates are derived from GIS acres in the TPCC database.

The 1988 TPCC introduced a woodland classification, which is divided into suitable or non-suitable woodlands.

WOODLAND - Woodland is forest land which is not included in the commercial forest land allowable harvest base, and also includes all fragile non-suitable land, non-commercial forest land, and non-suitable commercial forest land.

SUITABLE WOODLAND - Includes all non-commercial forest land and non-suitable commercial forest land that is biologically capable of supporting a sustained yield of forest products.

NON-SUITABLE WOODLAND - Includes all fragile non-suitable forest land that is not biologically and/or environmentally capable of supporting a sustained yield of forest products.

Two categories of Commercial Forest Land (CFL) were also established.

CATEGORY I CFL - Sites that can be reforested within 5 years of harvest using: 1) artificial regeneration and operational reforestation practices; OR 2) natural regeneration in the pine and true fir forest types. A reforested site meets all stocking level standards, seedling criteria, and management goals described in BLM Manual 5705 "Regeneration Stocking Survey". These sites can have a non-problem, fragile, reforestation, or dual (fragile and reforestation) classification.

CATEGORY II CFL- Sites that can be reforested within 6 to 15 years of harvest using natural and/or artificial regeneration in all forest types. These sites can have fragile, reforestation, or dual (fragile and reforestation) classifications.

Table T-16 shows age class distribution by land status and TPCC category.

Table T-16 Age Class Distribution on BLM Forest Lands as of October 1, 1988
(Acres)

	O&C			PD1/			CBWR			District Total		
Class	SCFL	SWL	NSWL	SCFL	SWL	NSWL	SCFL	SWL	NSWL	SCFL	SWL	NSWL
0	20,782	83	3,293	794	25	629	473	0	77	22,049	208	3,999
10	57,054	251	846	940	0	15	1,724	0	10	59,718	251	871
20	28,017	201	822	511	0	16	782	0	40	29,310	201	878
30	30,667	120	860	532	0	79	,326	0	1	32,525	120	940
40	12,311	49	499	659	9	18	391	0	3	13,361	58	520
50	7,649	63	162	371	8	5	182	0	7	8,202	71	174
60	3,936	68	111	290	0	8	45	0	0	4,271	68	119
70	4,673	91	631	649	0	34	66	0	3	5,388	91	668
80	5,710	134	547	462	14	50	30	0	30	6,211	148	627
90	8,430	241	540	1,397	21	121	477	0	39	10,304	262	700
100	7,632	51	1,014	1,556	0	124	675	12	103	9,863	63	1,241
110 to 150	42,952	464	4,068	3,278	69	421	2,647	0	206	48,877	533	4,695
160 to 200	65,106	720	4,524	2,360	14	202	743	0	0	68,209	734	4,726
200 Plus2/	48,982	215	1,697	1,060	2	62	2,671	0	105	52,713	217	1,864
Total	343,910	2,851	19,614	14,859	162	1,784	12,232	12	624	371,001	3,025	22,022

SCFL = Suitable Commercial Forest Land, SWL = Suitable Woodland, NSWL = Non-suitable Woodland.

1/ Acquired lands are included with the PD acres.

2/ Does not include 12,215 acres with a 10 to 40 percent component of trees of age 200 plus, which are categorized according to the dominant younger age class.

Source: GIS Forest Operations Inventory (FOI) acreage estimates with deductions for roads and non-forest lands. Riparian withdrawals within FOI units distributed proportionally between SCFL and SWL on a unit by unit basis.

Note the lack of acreage in the 50-100 year age groups.

Significant Differences

The 1988 TPCC does not have limited management, adverse location or statutory withdrawal classifications. These lands were reclassified, with the majority being included in the non-suitable woodland, suitable woodland or Category II CFL classifications.

Additional Comparisons of 1977 and 1988 TPCC - In the general scope of the guidelines that were set out for making these TPCC classifications, there are two major differences:

1. Adequately Stocked Criteria

   a. For the 1977 TPCC, all lands classified as CFL would meet the stocking criteria shown below. Stocking is expressed as the minimum number of well-spaced trees per acre (T/A) desired at the time of first intermediate harvest (age 30-50) on an area. The target stocking varies by site productivity class.

Site II	Site III	Site IV	Site V
320 T/A	280 T/A	245 T/A	200 T/A

   b. For the 1988 TPCC, all lands classified as CFL would meet the stocking criteria shown below:

Site II	Site III	Site IV	Site V
150 T/A	150 T/A	150 T/A	100 T/A

   As in 1977, stocking is expressed as a minimum number of well spaced trees per acre (T/A) desired by site class. However, the 1988 standard reflects the desired number of T/A at final harvest age (70-80 years).

   The change in number of well spaced trees required reflects changes in BLM stocking requirements. The standard used for the 1988 TPCC reflects the fact that biological, environmental, economic, or other factors may preclude achievement of higher stocking on some sites.

   The current standard is based on the estimated number of trees per acre needed to fully utilize the sites productivity potential at rotation age. It precludes intermediate harvests but requires sufficient trees per acre for full final harvest volumes.

2. Standard Silvicultural Operation

   a. Under 1977 guidelines land was classified non-problem from a silvicultural standpoint if it could be stocked to the level indicated, utilizing "normal silvicultural practices." These practices were defined as those things that would "normally" be done to the land to achieve the desired stocking level. These included planting, prescribed fire, control of competing vegetation, and animal damage control.

   b. Under 1988 guidelines land was classified non-problem from a silvicultural standpoint if it could be stocked to the level indicated utilizing "Standard silvicultural practices." These practices were defined as "one planting and one site preparation treatment". Any further action resulted in a restricted classification.

   Because of the above differences, a large portion of the CFL was classified as Non-problem in the 1977 TPCC, while the 1988 TPCC has very little land classified as Non-problem.

Harvesting Practices

The following harvest and silvicultural practices and the rationale for each are included in the 10-year MFP approved in 1983:

Clearcutting was determined to be the primary method for meeting the objective of converting slow growing older timber stands to young, rapidly growing stands. Most climatic and soil conditions on the District are favorable for the prompt establishment of regeneration in harvested areas using standard reforestation techniques.

Partial Cutting was also an optional harvesting method on those areas in the constrained timber base including individual tree selection and shelterwood cuts.

Commercial thinning in the Roseburg District was projected to commence as stands reach an average DBH of 11" and to continue at 20-year intervals. In the Douglas SYU thinning would commence at age 40 years and in the South Umpqua SYU the stand age would be about 45 years . The culmination of mean annual increment (CMAI) for both SYU's occurs at about 85 years.

Those areas that were commercially thinned or fertilized produced an increase in volume growth, the increase depended upon site index and stand age at final harvest.

All stands previously thinned or subjected to density control would be considered for commercial thinning if economically feasible. The feasibility of all sites was evaluated in terms of soil characteristics, topography, and potential damage to the residual stand to determine suitable areas.

Commercial thinning should occur in the 40-year to 70-year age class. These wild stands have not generally been subjected to intensive practices such as release, precommercial thinning, or fertilization. Many of these stands are small in size, have poor access, and occur on slopes that are inoperable. It was estimated that 20% of presently available stands are capable of showing positive results from commercial thinning.

Table T-6 shows by age class all acres that have been pre-commercially thinned. Ten percent of these acres will become available for commercial thinning during the decade of the 1990s. Opportunity for commercial thinning will increase in the second and third decades as young managed stands mature.

The number of commercial thinning entries and intervals should be based on an analysis of the biological, economic, and other aspects of this practice.

Mortality Salvage

Forest stands are simultaneously growing and suffering mortality. In immature stands (up to 80 years of age) gross growth generally far exceeds mortality. As stands advance into maturity, gross growth declines slightly but mortality increases. Mortality loss is associated with overcrowding, windthrow, and insect and disease attack. Harvest of accumulated dead and anticipated mortality in 200+ year-old stands will increase total yield of wood because timber that otherwise would be lost to decay can be utilized.

Logging Systems

Cable yarding techniques have been determined to be the best method for meeting the objectives of maintaining site productivity. Cable yarding is required on slopes greater than 35%. Many of the slopes with gradients of less than 35% are also cable yarded. On extremely fragile soils with slopes exceeding 70%, or where stream protection areas are encountered, full log suspension is required. For much of the District this can be obtained utilizing conventional yarding towers.

Ground-Based systems, using tractor skidding, are employed on the remaining harvest areas, generally on slopes of less than 35%.

Silvicultural Practices

Site Preparation is any planned treatment performed on a site prior to, or in conjunction with, a reforestation effort. Methods used may be manual, mechanical, prescribed burning, chemical, or a combination of these treatments. These treatments create a favorable environment for the survival of seedlings, provide tree planters access to mineral soil, and promote easier selection of planting spots which will improve seedling survival. The method prescribed for site preparation is dependent on specific site conditions.

> Prescribed burning is beneficial where heavy slash concentrations hinder planters accessibility to the site or where vegetative competition to seedlings from grass or brush species needs to be reduced. Burning may result in species such as scotch broom or ceanothus germinating, requiring a subsequent release treatment.
>
> Mechanical site preparation by ground-based equipment is limited by slope gradients. Gross yarding is effective as a site preparation method in areas where large accumulation of debris can be removed from fragile areas and brush competition is not a significant problem.
>
> Chemical site preparation is most effective where grass or ceanothus are present. This occurs most frequently at lower elevations. Chemical stump treatment of hardwoods is also effective. Manual site preparation is effective where individual planting spots are to be created in portions of harvested units. The Western Oregon Program-Management of Competing Vegetation FEIS also discusses site preparation alternatives (p 18-20).

Tree Planting of all areas within one year of harvesting and/or site preparation is planned. Planting spacing is partially determined by the expected survival of the planted seedlings. Survival is influenced by many factors, including soil, climate, and ground cover on the planting site. If reforestation surveys indicate plantations do not meet minimum reforestation standards the unit is scheduled to be replanted or interplanted. The purpose of these practices are to return harvested areas to a fully productive condition as rapidly as possible.

Animal Damage Control is performed on units where damage is expected or observed from browsing, clipping, or girdling animals. Treatment methods include tubing, bud capping, applying repellent to the desired trees, or controlling the animals causing damage. These treatments help insure survival, establishment, and growth of the desired crop trees.

Plantation Maintenance is performed on unestablished plantations to promote survival and growth of desired crop trees. Treatment may include paper mulching, artificial shading, reduction of competing vegetation by manual methods, or treatments to reduce insects or disease. Manual methods have proven to be less cost effective than chemical treatments used in the past.

Plantation Release is performed on sites where stands have become established but are still suffering from reduced growth and vigor due to competing brush and hardwoods. Heavy overtopping brush and hardwoods can also reduce survival of conifer crop trees. Treatments may include the removal or reduction of undesirable vegetation by mechanical or manual methods. Historically, herbicides had proven most effective because of lasting effects on the vigorous sprouting brush and hardwoods found on the District.

Precommercial thinning reduces the number of trees per acre to a level that will enhance growth. Excess trees are removed when trees reach 10 to 15 years of age or 10 to 15 feet in height.

Fertilization of stands may occur after precommercial or commercial thinning. Priority is given to those stands that are vigorous, or are on nutrient deficient sites. Applications may be repeated at 10 year intervals up to a maximum stand age of 80 years or 10 years before final harvest.

Genetically Improved Stock - The Western Oregon Tree Improvement Plan contains the framework for BLM's tree improvement strategy. Briefly this plan assumes: 1) superior parent trees will be identified by progeny test data; 2) seed from these superior parents will be available directly from the parents or from seed orchards; 3) the replacement of conventional stock with improved seedlings will be phased in over a period of time.

The level of increased growth associated with the sources of improved seed has been determined from analysis of progeny test data. The genetic gain will be phased in with priority given to planting the best stock on the best sites.

Conversion of brush or hardwood areas to productive coniferous forests increases future yield of timber products. This activity makes commercial timber production possible on lands that are otherwise not in the forest production base.

Root Diseases

Disease centers have been found to be small and scattered on this District.

The fungal root diseases that may cause damage to plantations and young natural stands are black stain root disease (caused by Ceratocystis wageneri), Armillaria root rot (caused by Armillaria mellea), laminated root rot (caused by Phellinus weirri), and Port Orford Cedar Root Rot (caused by Phytophthora lateral is).

Current management involves locating and identifying these diseases, predicting potential severity and modifying management activities to minimize damage.

Insects

Insect related mortality, particularly on marginal sites, occurs periodically. Overstory mortality by insects is accelerated in multi-layered stands by the competition of understory conifers and hardwoods which increases stress on overstory conifers. Direct intervention, such as spraying, for control of insect populations is neither cost effective nor likely to result in any real long-term benefit. Current management involves mortality salvage of insect-killed trees.

Minor Forest Products

During the last several years the District has experienced an increased demand for a variety of minor forest products.

While firewood consumption for domestic heating increased since the energy crisis of the late 1970's, demand has remained relatively stable. Approximately 29% of firewood consumed in the central Douglas County area originates from BLM lands. Between 1986 to 1988, the District sold an annual average of 4,520 cords of firewood; for comparative purposes, during that same time span, the Umpqua National Forest sold an annual average of 4,301 cords.

Table T-17 displays some of the types and quantities of forest products sold from District lands during the period 1986-1988.

Table T-17 **Minor Forest Products Sold by Fiscal Year**

Product	Unit	1986	1987	1988
Firewood	MBF	2,005	2,688	2,088
Bolts & Shakes	BF	1,000	1,500	8,000
Post	BF	2,548	4,982	3,629
Corral Poles	BF	400	2,160	2,980
Wildlings	No.	40	110	200
Boughs	Pounds	13,550	13,000	17,000
Huckleberry Brush	Bunches	500	--	1,000
Greens (bear grass, salal, cascara bark, moss)	Bunches	13,550	1,000	17,120
Marginal Logs	MBF	74	137	210
Mushrooms	Pounds	--	--	170

Interrelationships

Other BLM programs that have affected the timber management program are listed below with their impacts. Some forest practices have been challenged with concerns about potential habitat loss, public health, aesthetics, and economic considerations. Programs, concerns, or activities that have affected the timber management program are:

Fish and Wildlife Management: Modification of road construction standards have been imposed for fisheries, including reduced gradients for culvert installation. To maintain favorable habitat conditions for terrestrial wildlife, harvest unit sizes are generally restricted to 40 acres in size, or a maximum of 660 feet to cover. Roads have been closed to protect wildlife and watershed values resulting in inefficiencies for subsequent forest management. Harvested units may also be seeded with favored wildlife forage species resulting in increased competition for available moisture for seedlings. Snags or replacement trees for snags have been retained for cavity nesting species, with a goal of averaging one conifer wildlife tree per acre on all lands included in the intensive forest management land base. Three conifer wildlife trees per acre are reserved on those lands withdrawn from the CFL base and those included in the constrained management land base. Five down logs per acre on the total land base is also a District goal.

Watershed Management: To minimize soil erosion and enhance or protect watershed values, operational restrictions have been imposed on timber harvest operations. Restrictions may include: 1) limiting road construction to the dry season, 2) surfacing roads or restricting hauling to the dry season, 3) seeding and fertilizing exposed soil, 4) restricting tractor logging to slopes less than 35%, and 5) preserving riparian zones.

On extremely fragile soils, restrictions are imposed on road locations and end-hauling of excess material is required. Logging restrictions may include full or partial log suspension, and gross yarding of headwalls on slopes in excess of 70%.

Vegetative buffers are also required adjacent to streams when fertilizer or herbicides are to be applied.

Vegetation Management: Use of herbicides has been banned on Federal lands since 1984, except for roadside noxious weed application. Herbicide use has been replaced by more expensive and labor intensive methods of vegetation control such as mulching or manual brush cutting and increased use of prescribed fire.

Prescribed Fire Management: - Fire reduces slash and unwanted vegetation, exposing planting spots. Prescribed burning has markedly increased since the ban on herbicides. At the same time, public concern over haze and airborne particulates affecting respiration has increased, resulting in fewer days on which burning is permitted. The objectionable qualities of smoke can be minimized only when air is unstable allowing movement of the smoke into the upper atmosphere (Western Oregon Program, Management of Competing Vegetation, EIS, final, Feb. 1989).

To increase available burn days, the District has been piling slash on some units. Concentrating slash in piles allows burning during late fall or winter when there are more favorable dispersal conditions and smoke clearances are easier to obtain.

Visual Resource and Recreation Management (VRM): Restrictions include alteration or restrictions on unit size and/or location, road construction and location to maintain visual quality, extension of rotation age in visually sensitive areas and in some areas maintain visual variety by retaining meadows and brushy knobs. Each of these restrictions could result in increased harvest costs, construction costs or reduced potential productivity of the forest.

Threatened & Endangered (T&E) and Sensitive Species: The northern spotted owl was listed as a threatened species in 1990. Judicial and legislative actions concerning habitat requirements for the owl have caused major uncertainty for long-range timber sale plans as well as approved annual sale plans. The litigation and listing of the spotted owl has resulted in a reduction of available land on which to place timber sales. The ASQ has been reduced to reflect the at least temporarily restricted land base. However, timber sales have still had to be placed closer together in time and space than desired. This has caused difficultly in planning sales, acquiring legal access and impacts non-timber resources. Impacts on the BLM's timber management program are still being evaluated.

Protection of animal species has required uncut buffers, restricted operating seasons and required the retention of roost trees.

Protection of plant species has required deletion or modification of planned harvest areas or modification in logging systems such as directional falling, or other restrictive logging methods and the modification of burning prescriptions.

Minerals Management: The mining laws detail who has surface rights to timber depending on land status and when a claim was filed. Sales of timber on these claims is often contentious.

Cultural Resource Management: Road or unit locations or boundaries have been altered to avoid cultural or artifact locations.

Rural homesite encroachment: Conflicts occur when timber sales are adjacent to rural homesites. Road construction, use of herbicides, clearcutting, and prescribed burning are the most frequently challenged issues.

Access: Access to approximately 70,000 acres of commercial thinning and mature timber remains to be developed on the Roseburg District. Both physical and legal access must be obtained to fully manage the intensive forest base. As of October 1, 1988, 169 additional easements are estimated to be necessary to complete access to BLM commercial forest lands. As further subdivision of adjacent private lands occurs, the District's workload will increase. Reciprocal agreements with adjacent industrial forest land owners have minimized access problems to a great extent.

During the TPCC inventory for the timber management plans for the decade of the 1980's, BLM identified some lands, which did not appear to be accessible, as "adverse location." For the current planning effort, the TPCC inventory was revised and no longer contains that designation or considers the economic feasibility (or practicality) of managing isolated or lower site parcels of commercial forest land.

Under the revised TPCC, lands could have been brought into the timber management base which may not have been manageable without direct subsidy of timber management activities. For this planning effort, a separate analysis was done to identify commercial forest land areas where biological, physical or economic constraints were expected to result in uneconomical or unfeasible to manage lands (UEUF). This analysis process was prescribed by the State Director to analyze UEUF lands where they were a substantial component of the available forest land base. An initial screening was done by SYU of all tracts suspected to be UEUF. After identifying the amount of UEUF lands in a SYU, an estimate was made whether the total number of acres indentified in the initial screening of the SYU caused an ASQ adjustment exceeding one mmbf. This was done by the following method:

$$\text{Total acres from initial screening} \times \frac{\text{Current plan intensive base ASQ}}{\text{Current plan intensive base acres}}$$

The indicated adjustment for Roseburg District's Douglas and South Umpqua SYU was less than 0.8 mmbf. Since UEUF lands fell below the initial screen level, intensive analysis was not required.

In cases where the ASQ adjustment is less than one mmbf for a SYU, such harvest level is not required to be identified in the sensitivity analysis of the AMS maximum nondeclining harvest level, or the sensitivity analysis of timber management prescriptions for the RMP preferred alternative.

DEMAND

This section will be provided in a supplement available prior to analysis of RMP alternatives.

VI. MANAGEMENT OPPORTUNITIES

Derivation of the highest non-declining harvest level for the District is dependent on employing every opportunity to maximize yields. It differs from current management direction primarily because it is not constrained by other resource demands or budgetary realities. Management assumptions and practices on the operable land base are very similar to the current management direction and may differ only where better data and/or knowledge modifies a practice. The more important opportunities that influence the harvest level are: operable land base, management assumptions, and intensive management practices.

Operable Land Base

The most important variable influencing the harvest level is the land base for timber management. Some lands are not included in the base used to derive the highest non-declining harvest level such as non-commercial forest lands, fragile sites, withdrawals for threatened and endangered (T&E) species, Congressionally designated areas and developed recreation areas. Additionally, other lands such as those areas managed for visual (VRM) or wildlife resources may be subject to some type of constraint on management.

Table T-18 summarizes the acres which are managed for T&E species and developed recreation sites. Details of these summaries are found in the Vegetation, the Animals, and in the Recreation AMS.

Table T-18 Acres of Land Managed Under the Current Plan for Protection of Threatened & Endangered Species and Recreation

T & E SPECIES	Land Status	SCFL	SW	NSWL	NF	Total
Name						
Bald Eagle	PD	43	34	15	24	116
	O&C	2,985	26	214	60	3,285
Developed Recreation Sites						
Name						
Scaredman	O&C	6			6	12
Rock Creek	O&C	4			15	19
Mill Pond	O&C				23	23
Susan Creek (Homes)	O&C	43		5	3	51
Susan Creek	O&C				34	34
Swift Water	O&C	56		5		61
Lone Rock Boat Ramp	O&C				6	6
Wolf Creek Trail	O&C	1		79	7	87
Cavitt Creek Falls	O&C				16	16
Tyee	O&C	12				12
Total T&E:		3,028	60	229	84	3,401
Total Recreation		122	0	89	110	321
Grand Total		3,150	60	318	194	3722

Source: Acreage estimates are derived from GIS thematic layers.

Management Assumptions

The following assumptions have been used to derive the highest non-declining harvest level:

- Funding is available for all practices.

- Manage all forest lands except legally constrained or non-suitable woodlands for timber production.

- Emphasize the timber management and reforestation systems that will maximize timber production.

- Size of harvest units is based on greatest efficiency of field operations consistent with assurance of prompt reforestation.

- All proven and available intensive practices are used for site preparation, seedling protection, plantation maintenance, and plantation release. Emphasis is placed on those tools which have proven most effective.

- Reforest harvested lands immediately after harvest with adaptable commercial species.

- Emphasize the utilization of genetically improved stock in accordance with the Western Oregon Tree Improvement Plan.

- Cooperate with other districts in the management of associated tree seed orchards to produce adequate supplies of improved seed.

- Reforest root disease centers with indigenous resistant tree species.

- Practice initial spacing control of seedlings through planting or thinning in conjunction with the control of competing vegetation in order to maximize wood production.

- Practice commercial thinning on present and future stands where research indicates increased wood yields will result.

- Apply fertilizer to all present and future stands where research indicates increased yield will result.

- Convert all commercial forest sites presently occupied mostly by grass, hardwoods and brush to conifers.

- Hardwood sites not suitable for the production of conifers will be managed for sustained yield of hardwood species, except those sites classified as fragile, nonsuitable.

Economic Feasibility of Intensive Management Practices

The practices of precommercial thinning, fertilization, commercial thinning and stand conversion were analyzed. Precommercial thinning, fertilization and commercial thinning were all found to have a positive effect on net present value and are considered economically feasible. The analysis of stand conversion was used to set the maximum allowable cost for the identification of conversion opportunities to treat.

Intensive Management Opportunities

Increase size of harvest units

Management efficiency could be increased, i.e., cost of sale preparation, contract administration, logging, site preparation, and reforestation tend to be lower on larger harvest units than on small, dispersed clearcuts.

Mortality and growth losses could be reduced along the boundaries of clearcuts, as trees on or near the line are scorched by slash fire, blown down or broken off by wind, or stressed by the sudden exposure to the elements. These losses cannot always be salvaged. Larger units have proportionally less boundary length per acre than smaller units, and the losses associated with edges would therefore be lessened.

Environmental impacts may be reduced when timber is harvested from larger blocks. The disturbances of road building and logging occur less frequently within a watershed over the long term.

Some disadvantages of large harvest units would be to provide less diversity of wildlife habitat, smoke management approval for slash burning could be more difficult to obtain with larger total fuel loadings. Cumulative impacts on small watersheds might be increased beyond tolerable limits.

Manage for increased wood size and quality.

Timber management plans could be designed to produce high-value products. Larger stem sizes, higher wood density, greater strength, fewer and smaller knots, and less stem taper all produce significant increases in stumpage value. These objectives could be achieved through longer rotations and other modified silvicultural practices.

Promote land exchanges for more efficient management.

Exchange scattered parcels of BLM land for tracts which would block up ownership. Efficiency would be gained by:

- Reducing the amount of property line surveys needed.

- Allowing greater use of natural topographic features as harvest unit boundaries, thus decreasing the number of unit boundaries that have to be located on ownership lines which do not fit the topography. This would greatly benefit activities such as road construction, logging, site preparation and vegetation control.

- Reducing the need for future easements and right of way for access.

- Larger blocks of ownership would reduce conflicts with adjacent landowners.

Maintain Integrity of Forest Lands

Residential development adjacent to BLM lands generally increases BLM management costs in activities such as prescribed burning, application of herbicides, and acquisition of easements. The BLM could minimize these problems by working with county planning departments to maintain the integrity of forest land zoning by discouraging the counties from allowing variances or Conditional Use Permits in existing primary resource land zones adjacent to BLM lands. Additional detail on this opportunity is found in the Lands AMS.

Increase Firewood Opportunities.

Timber harvest areas, especially clearcuts, have been a primary source for personal and commercial firewood cutting. Designated areas could be managed for firewood harvest. These areas should be adjacent to existing roads and should not interfere with planned intensive forest management operations. Stands classified as "suitable woodland" in the TPCC would be the preferred choice for such areas.

There are no known biomass proposals on the District.

"New Forestry" (Ecological Forestry concepts) Opportunities

Some forest scientists have proposed conceptual changes to traditional forest practices to allow for biological and functional diversity. These concepts are commonly referred to as "new forestry". Their thesis is that maintaining forest productivity in the long term may require that some consideration be given to maintenance of biological diversity in the managed forest and that maintaining diversity requires the presence of some portion of all seral stages and attention to the dispersion of harvesting practices in time and space. Retention of the structural and functional components of the forest on harvest units, particularly with regard to the retention of coarse woody debris may be particularly important. (Franklin, 1988). Many existing silvicultural practices tend to simplify forests. "New forestry" options may have an adverse impact on immediate forest yield, but may maintain the long term productivity of the forest.

Research Opportunities

Monitor the progress and results of the Coastal Oregon Productivity Enhancement (COPE) project.

Implement those practices which could increase forest production, reduce the cost of harvesting, or minimize conflicts with other resources. Progress and results of studies are reported in the COPE Program Progress Reports.

Forest Management in Environmentally Sensitive Areas

Alternative logging systems and silvicultural practices may permit harvest in sensitive areas. Long term stand management need not be based on a dense road network or even-aged management. Modeling indicates that natural regeneration under partial cut approaches would be capable of permitting sustained timber harvest in such areas.

Smoke Management: Reduced Dependence on Prescribed Fire

Limitations on prescribed fire due to smoke management restrictions and logistical limitations have caused a backlog of unburned units. Alternatives to provide for planting access and seedling survival could be used to reduce the dependance on prescribed fire as a site preparation tool. Chainsaw planting, mulching, and increased attention to species, stock type, seedling vigor and intensive administration of planting are techniques that could be used on some sites. Some of these practices may be less cost effective than prescribed fire.

HARVEST SCHEDULING

Harvest scheduling involves quantifying the existing forest inventory and projecting the inventory into the future to test a long term, non-declining harvest level. This harvest level is referred to as the ASQ.

Allowable Sale Quantity (ASQ) Determination

The ASQ is determined through the use of Micro*Storms (a relational data base), Organon, (a growth and yield model) and TRIM+ (a harvest scheduling model). Some assumptions about future management that directly affect the ASQ runs in TRIM+ include minimum harvest age, regeneration lag, future stocking levels, anticipated gains for planting genetically improved stock, the amount and frequency of precommercial thinning, commercial thinning and fertilization, and the stand age when these treatments are applied.

Micro*Storms Database

The basic storage location for acres and forest related resource information is a large relational database called Micro*Storms. The database is separated into three primary files; 1) Acreages, timber type, site, treatments, etc.; 2) Timber Productivity Classification (TPCC), and 3) 5-Point Continuous Forest Inventory (CFL) plot data.

Within each file, there is a separate record of information for each plot or unit. Each file contains many kinds of data. For example, the Site file records contain data such as the Basic Resource Unit (BRU) and Existing Stand Condition (ESC) codes, acreage, timber type, site index, accomplished and recommended treatments, timber volumes, stand age and land use. Information pertinent to the analysis of alternatives from these or other data files has been linked to their respective digitized GIS maps.

Basic Resource Units (BRU). Within TRIM+, data is segregated by Sustained Yield Unit (SYU), Resource Area, land status, management status and timber type. These groups of data are called Basic Resource Units. The ASQ and other output data from TRIM+ is reported by BRU and for groups of BRU's known as Group Resource units (GRU's) as well as for the entire sustained yield unit.

GRU Management Intensity (MI) Levels. Within each GRU in TRIM+ model, there are eight available management regimes called MI's that can be used to simulate various management assumptions or intensity levels. Each requires yields and acres by age class, and information about shifting acres from one MI to another during growth and at final harvest. Specific configuration of the MI's varies within each GRU.

Existing Stand Condition (ESC) Codes. ESC codes are incorporated in each BRU. ESC codes help to group, sort and track similar kinds of stands. This sorting is accomplished by giving each Micro*Storms site file record (Forest Operations Inventory or FOI Unit) an ESC code from a list of 28 that best describes the forest stand or condition of a particular unit.

5-Point Continuous Forest Inventory (CFI)

Tree volumes on present stands are derived from 508 permanent inventory plots distributed throughout the District. Both conifers and hardwoods were cruised by certified BLM cruisers to the same standards used in timber sale preparation. The inventory stratification and sampling error at the 90% and 95% Confidence Levels (CL) are displayed in Table T-19 for each SYU. Cubic foot (CF) volumes were computed from the inventory data using a BLM software program called UNIT 1. Summary plot data is stored in the Micro*Storms data base CFI file. These data include general site and specific stand descriptors such as board foot (BF) and CF volume estimates, growth , basal area, trees per acre, and average diameter breast height and height.

Table T-19: Stratification of Inventory Plots by SYU

DOUGLAS SUSTAINED YIELD UNIT

STRATA		No. Plots	GIS Acreage	Strata Sampling Error[1/] (90% CL)	Strata Sampling Error[1/] (95% CL)
10/15	Non-stocked	8	15,130		
11/16	Premerch	119	100,366	19.88	23.93
12/17	Young Merch	44	36,115	11.76	14.16
13/18	Mature	66	58,586	9.82	11.82
14/19	Old-growth	39	72,770	11.33	13.64
40/50	Suitable Woodland	2	422		
41/51	Non-suitabie Wdld	2	6,153		
60/70	Non-forest/Rec	10	1,900		
	TOTAL	290	291,442		

[1/] Percent Sampling Error = 8.45%

SOUTH UMPQUA SUSTAINED YIELD UNIT

STRATA		No. Plots	GIS Acreage	Strata Sampling Error (90% CL)	Strata Sampling Error (95% CL)
10/15	Non-stocked	9	6,486		
11/16	Premerch	69	30,485	26.42	31.80
12/17	Young Merch	29	9,741	17.22	20.72
13/18	Mature	39	18,405	12.20	14.69
14/19	Old-growth	57	34,088	11.19	13.47
40/50	Suitable Woodland	1	484		
41/51	Non-suitabie Wdld	3	3,627		
60	Non-forest/Rec	11	1,235		
	TOTAL	261	104,551		

[1/] Percent Sampling Error = 9.59%

[1/] All sampling errors computed using live and dead cubic volume estimates for both firm and chip material.

Table T-20 displays a summary of stocking density and growth on inventory plots which were remeasured in 1988. This data provides an indication of stocking and growth which can be compared with projected yield curves in Organon simulator programs.

Table T-20: Stocking Density and Growth Between Past and Present Inventories from Age Classes 10-90 Years

ROSEBURG DISTRICT

Treatment	Present Age Class	Number of Plots	Merch. Conifer Avg. Trees/acre		Merch. Conifer Avg. CF Vol/acre		Annual Growth Average CF Vol/acre
			Past	Present	Past	Present	
SYU 34 - SOUTH UMPQUA							
None	10	8	0	9	0	56	5.6
	20	13	5	14	43	133	9.0
	30	8	20	76	177	963	78.6
	40	5	48	68	1,323	1,807	48.4
	50	5	30	98	928	1,747	81.9
	60	3	65	81	1,114	1,579	46.5
	70	6	85	86	4,050	5,024	97.4
	80	3	87	85	3,436	3,253	-18.3
	90	9	127	120	4,593	5,725	113.2
PCT & Fert	20	3	11	41	286	444	15.8
	30	1	9	86	466	1,188	72.2
	40	1	44	129	720	2,446	172.6
	50	1	35	48	800	919	11.9
SYU 35 - DOUGLAS							
None	10	28	0	2	0	7	0.7
	20	34	7	41	34	341	30.7
	30	19	24	110	239	1,314	107.5
	40	7	146	171	2,299	3,705	140.6
	50	6	194	139	4,240	4,088	-15.2
	60	9	71	90	3,019	3,811	79.2
	70	7	90	119	4,454	5,257	80.3
	80	5	139	151	5,313	6,121	80.8
	90	2	119	119	8,772	9,755	98.3
PCT & Fert	20	2	0	42	0	250	25
	30	10	18	127	164	1,643	147.9
CT	30	1	0	88	0	1,085	108.5

Note: All plots in this analysis were remeasured plots which did not have any relocated points.

Disparities in trees and volume per acre from the past to present inventories may be due in part to changes in BAF between measurements.

Organon

Managed Stands -Yields for managed stands were projected using the Organon growth and yield model. The Organon yield simulator is built upon a database derived from research plots installed in mixed conifer stands of southwestern Oregon. The study area for this model is adjacent to and south of the Roseburg District. The Organon growth and yield model was designed primarily to simulate the growth and yield of Douglas fir and mixed conifer stands of southwestern Oregon. Site index, fertilization, commercial and precommercial thinning, stocking levels, and hardwood competition are some of the input variables that Organon can accommodate in making yield projections. The BLM version of Organon incorporates BLM's own volume regressions and cruising standards.

The Organon model provides an option to use tree list and tree condition data from existing stands as a starting point for simulation. Sources of tree list data include forest inventory plot strata and/or special stand exams to portray average stand conditions. The simulation of yields for representative future plantations requires considerable professional judgment and knowledge of tree growth and stand characteristics unique to the Roseburg District. An adjustment was made in developing yield curves for fertilization. This adjustment reduced yield 15% due to application irregularities. This was based on research data that shows that response is not in direct proportion to application rate. (Silviculture Working Group-April 1989, IM-OR-90-272)

All Organon yields are gross volumes. Reductions for insect and disease losses, and for defect and breakage based on District timber sale data is applied to the projected yields for future stands. A series of Organon runs were made to determine yields for combinations of operationally feasible and optimal practices.

Gains from the genetic tree improvement program have been calculated by the District Geneticist. To incorporate these gains into TRIM+, the Organon runs for MI 5 - MI 18 were adjusted by raising the site index until volume matched the anticipated gain from planting improved stock.

Unmanaged Stands In contrast to yields from published stand tables or simulation used with managed stand a, yields for unmanaged stands are calculated from existing plots. These empiric yields are preferred over published yield tables wherever there are sufficient plot data on which to build yield curves. Empiric yield curves were generated for unmanaged conifer stands for the average site index of each SYU.

TRIM+ ASQ Runs

The ASQ is determined by TRIM+ (Timber Resource Inventory Model Plus Harvest Scheduling), a binary search type model that has been designed to operate on enhanced personal computers. Key elements in selecting this model are:

- ability to make individual ASQ runs on multiple minimum harvest ages
- ability to handle various land use classes simultaneously
- ability to make ASQ runs at the district level
- enhanced report generating and graphics capability

TRIM+ functions similarly to the SIMIX model used by the BLM to generate ASQ's in the 1970's and 1980's. ASQ volumes from TRIM+ are in merchantable cubic feet (CF). Equivalent ASQ estimates in board feet are also provided.

TRIM+ requires a variety of information in order to complete ASQ computations and harvest scheduling. The information needed falls into three basic categories: 1) acreage, 2) volumes, and 3) management assumptions.

When all of the acres, volumes and management assumptions are assembled in the appropriate files in TRIM+, the model makes repetitive ASQ runs to find the optimal sustainable harvest level for a particular management scenario. After the total ASQ run is completed, further analysis of the contribution of each GRU, Resource Area, SYU, or land status type can be made. The final AMS TRIM+, run (Alternative A) will serve as a foundation for subsequent ASQ runs for various alternatives. Table T-21 will display the projection for acres by decade used in deriving the highest non-declining ASQ. Table 21 will be provided in a supplement available prior to analysis of RMP alternatives.

Allowable Cut Effect (ACE)

The Roseburg District's commercial timberlands are composed primarily of old growth (200+ years old) and recently cut over stands which exhibit a relatively low average annual growth. This results from slow or negative growth of the old stands and reflected in that merchantable growth is not measurable in the young stands until they approach 20 years of age. Such a forest is termed "in transition" from an unmanaged to a managed or regulated state.

In the classical sense, the regulated state is achieved when average annual harvest and growth are in equilibrium. At this point, maximum yield on a sustainable basis is reached. To compute an ASQ for a forest in the transition state using this criteria would be extremely conservative and greatly lengthen the time until the regulated state was achieved.

The BLM uses an alternative approach which is to project growth into the future based upon assumptions about management levels and to utilize excess harvest age timber (mainly old growth) to bridge the time gap until the ultimate growth level is achieved. This process of taking credit now for future growth resulting from intensive management practices has been termed the "allowable cut effect" (ACE). Sensitivity analysis runs identify elements of the ACE.

Sensitivity Analysis of Timber Management Prescriptions

Sensitivity analysis of timber management prescriptions identifies opportunity costs and trade offs of variations in management intensity or other aspects of timber management on those lands allocated primarily to timber production. The analysis includes any effects of such variations that would apply to lands allocated in an alternative primarily for other purposes, but with provisions for planned timber harvest. The primary focus of these sensitivity analyses is the effect on the ASQ and attendant local employment and county revenue change. These analyses will be considered in the formulation of timber management prescriptions for the preferred alternative, and also identify the impacts of possible future adjustments in timber management prescriptions that may occur as a result of actions outside BLM control, such as court injunctions.

For comparative purposes the following sensitivity analysis runs will be made to show how the ASQ would change as management alternatives change.

1. Highest non-declining even flow: The non-declining harvest level if effective and economically feasible harvest and silvicultural practices are used.

2. Culmination of Stand Growth: The non-declining harvest level if no stands younger than culmination of mean annual increment (CMAI) are planned for final harvest, and if all appropriate intensive management practices are applied.

3. Minimum harvest size: The non-declining harvest levels if the minimum average tree diameter of a stand to be harvested were constrained at 12, 16, 20, and 24 inches, respectively.

4. Forego intensive practices: The non-declining harvest level if each of the following management practices were not used. A separate calculation would be made for each practice foregone:

   - planting of genetically improved stock

   - fertilization

   - precommercial thinning

   - stand conversion

Table T-22 will display summary data on the potential highest nondeclining harvest level, for the land base described above, and for each of the sensitivity analysis runs. Table 22 will be provided in a supplement available prior to analysis of RMP alternatives.

Efficiency of Intensive Management Practices

This section will be provided in a supplement available prior to analysis of RMP alternatives.

REFERENCES

Fight, Roger D.; Thomas D. Fahey, and David G. Briggs. 1989. Growing Douglas-fir for "quality" market. Paper presented at SAF convention, Spokane, WA, September 24-27, 1989. 4 pp.

Franklin, Jerry F. 1988. Structural and functional diversity in temperate forests. in E.O. Wilson, Editor. Bio-diversity. National Academic Press. p 166-175.

Franklin, Jerry F., Kermit Cromack, Jr.; William Denison, et al. 1981. Ecological characteristics of old growth douglas-fir forests. Gen. Tech. Rep. PNW-118. U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR. 48 pp.

Gedney, Donald R. 1982. The timber resources of western Oregon - highlights and statistics. USDA Forest Service resource bulletin. PNW-97. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Gedney, Donald R.; Patricia M. Bassett, and Mary A. Mei. 1986. Timber resource statistics for non-federal forest land in southwest Oregon. USDA Forest Service resource bulletin. PNW-138. Pacific Northwest Forest and Range Experiment Station. Portland, OR.

Gedney, Donald R.; Patricia M. Bassett, and Mary A. Mei. 1987. Timber resource statistics for non-Federal forest land in west central Oregon. Bulletin PNW-143. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Harris, Larry D. 1984. The fragmented forest: island biogeography theory and the preservation of biotic diversity. The University of Chicago Press, Chicago, IL. 211 pp.

Haynes, Richard W., Thomas D. Fahey, and Roger D. Fight. 1988. Price projections for selected grades of Douglas-fir lumber. Research Note PNW-RN-473. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR. 10 pp.

Johnson, K. Norman, and John Beuter, et al. 1990. Timber for Oregon's tomorrow - the 1989 update. Forest Research Lab., College of Forestry, Oregon State University, Corvallis, OR 183 pp.

Maser, Chris; Robert F. Tarrant; James M. Trappe and Jerry F. Franklin. 1988. From the Forest to the Sea: A story of fallen trees. General technical report PNW-GTR-229. U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 153 pp.

McArdle, Richard E.; Walter H. Meyer, and Donald Bruce. 1961. The yield of Douglas-fir in the Pacific Northwest. Technical bulletin 201. U.S. Dept. of Agriculture, Washington, D.C. 74 pp.

Old-Growth Definition Task Group. 1986. Interim definitions for old-growth Douglas-fir and mixed-conifer forests in the Pacific Northwest and California. Research Note PNW-447. U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 7 pp.

Oregon Department of Forestry. Oregon timber harvest report. 1977 through 1988. Salem, Oregon.

Perry, D.A. et al., (editors). 1989. Maintaining the long-term productivity of Pacific Northwest forest ecosystems - symposium proceedings. Timber Press Inc., Portland, OR 256 p.

Samson, M.; Hailey, J.R.T. 1989. Status of machine stress rating oflumber 25 years after commercial implementation. Forest Products Journal 39 (11/12): p. 49-52.

Senft, J.F.; Bendtsen, B.A.; Galligan, W.L. 1985. Weak wood - fast grown trees make problem lumber. Journal of Forestry 83: p. 476-484.

Trees To Know in Oregon, (Extension Bulletin 697, Oregon State University and the State Department of Forestry. 1975.

USDI,BLM,OSO 1986. Handbook 5251.1. Timber production capability classification. Oregon State Office, Portland, Oregon.

Western Oregon Program - **Management of Competing Vegetation FEIS**. February 1989.

Western Oregon Tree Improvement Plan. 1989.